AUGUST 1959 VOL. VII

FAO PLANT PROTECTION BULLETIN

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS - ROME

A PUBLICATION OF THE WORLD REPORTING SERVICE ON PLANT DISEASES AND PESTS

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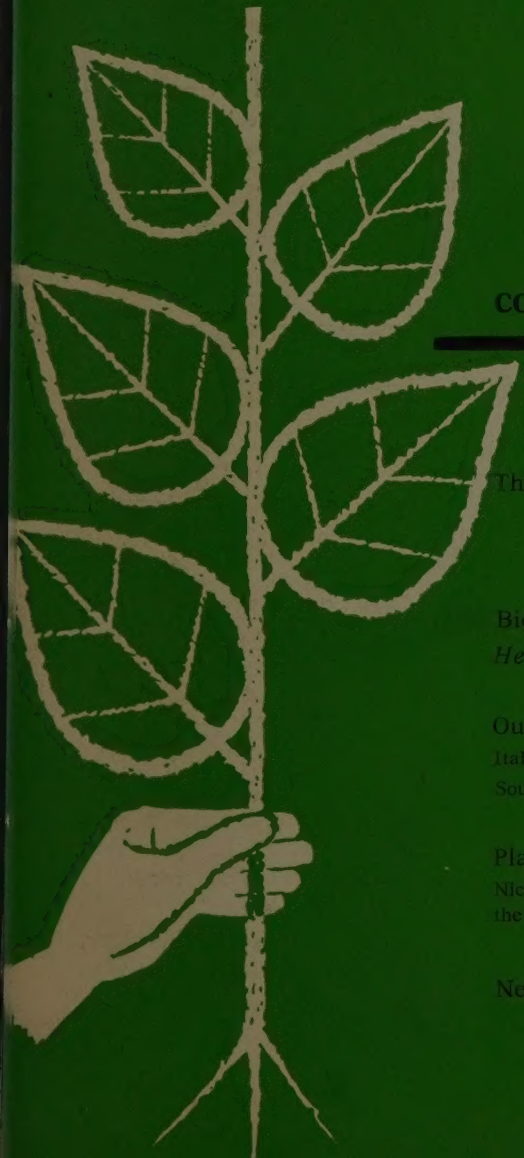

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FAO PLANT PROTECTION BULLETIN

is issued as a medium for the dissemination of information received by the World Reporting Service on Plant Diseases and Pests, established in accordance with the provisions of the International Plant Protection Convention, 1951. It publishes reports on the occurrence, outbreak and control of pests and diseases of plants and plant products of economic significance and related topics, with special reference to current information. No responsibility is assumed by FAO for opinions and viewpoints expressed in the Bulletin.

Manuscripts for publication, or correspondence regarding the World Reporting Service, should be addressed to Dr. Lee Ling, Plant Production and Protection Division, FAO, viale delle Terme di Caracalla, Rome, Italy; subscriptions and other business correspondence to the Distribution and Sales Section, FAO, viale delle Terme di Caracalla, Rome, Italy.

The Bulletin is issued monthly in English, French, and Spanish, and twelve numbers, commencing with the October issue in each year, constitute a volume. Subscription rates are $ 3.00 or 15s. per annum; single numbers are priced at $ 0.30 or 1s. 6d. The citation is FAO Plant Protection Bulletin, or, in abbreviation, FAO Plant Prot. Bull.

Vol. VII, No. 11 - August 1959

FAO PLANT PROTECTION BULLETIN

A PUBLICATION OF THE WORLD REPORTING SERVICE ON PLANT DISEASES AND PESTS

Three Virus Diseases of Plants New to the Philippines

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Leaf curl of tobacco

Leaf curl of tobacco is a new disease of virus origin which has not previously been investigated in the Philippines. In 1958, San Juan[1] reported the first occurrence of the disease in the College of Agriculture and Central Experiment Station, University of the Philippines, College, Laguna. He found that about 10 percent of the plants of Virginia tobacco variety Golden Harvest were infected with leaf curl in the field.

The common symptoms of the disease consist of leaf puckering, accompanied by marked darkening of leaf color and curling downward of leaf margins. The veins, when viewed through transmitted light, appear thickened on the underside and are irregularly curved. They are dark green in contrast with the translucent veins of healthy plants. The disease is also characterized by the production of outgrowths or enations from the veins on the lower surface of the leaves. These outgrowths vary in size, ranging from inconspicuous frills to comparatively large leafy growths. The development of these pronounced leaf abnormalities on infected plants seems to depend largely upon the environmental conditions prevailing, as well as upon the physiological reaction of the variety or strain of tobacco to the disease.

Tobacco plants when seriously infected are stunted in growth. The leaves are distorted, curled or crinkled, prominently twisted, bunchy in appearance due to puckering and savoying, and very much reduced in size. They are abnormally thick and brittle, resulting in poor quality.

Seedlings or new transplants which have been infected during the early stage of growth are abnormally stunted. Plants that are infected later during the growing season show the characteristic curling or crinkling and puckering or savoying of leaves.

Preliminary transmission study, using whiteflies (*Bemisia gossypiperda* Misra & Lamba) as vectors, shows that Golden Harvest, a filler-type of Virginia tobacco, is very susceptible to leaf curl virus. Experiments on various methods of transmission, use of other insect vectors, host range, and reaction of different tobacco varieties to the disease are in progress.

Leaf curl of cotton

As the Philippines are just in the process of developing a cotton industry, the discovery of the destructive leaf curl disease has caused much concern. The disease occurred suddenly on cotton plants used for rearing aphids (*Aphis gossypii* Glover), which were to be used in transmission tests of abaca mosaic. Practically all such plants, even though they originated from healthy plants for several generations, were infected. The source of infection cannot be explained, but on the affected plants there were

[1] San Juan, M. O. 1958. Occurrence of the leaf curl disease of tobacco in the Philippines. *Philipp. Agriculturist* 41 : 527-530.

Figure 1. Cotton leaves infected by leaf curl, showing severe distortion. Note the vein clearing in the lower leaf and merging of main veins in the upper leaf.

whiteflies (*Bemisia gossypiperda*), the recognized vector of leaf curl of cotton, in addition to aphids.

The first sign of the disease appears at the top of the plant, causing severe deformation of the leaves with distinct chlorosis of the veins, and often accompanied by conspicuous vein thickening. The main veins are often gnarled on the underside. The leaves are peculiarly deformed, with prong-like structures developed at the tip (Figure 1), and curl downward.

The flowers of affected plants are checked in growth and become abortive. The petals gradually turn yellow and wither, and eventually the flowers fall off. When the infection occurs early, the affected plant becomes stunted, resulting in complete sterility. On the other hand, if infection occurs rather late, only the leaves of the top branches become curled. Occasionally, bolls develop but are reduced in size and show chlorosis; such bolls may or may not open at all.

Results of preliminary transmission experiments indicate that the virus was transmissible by whiteflies (*Bemisia gossypiperda*). Cotton varieties Deltapine 15 and Kapas Purao were used, on which symptoms appeared one month after inoculation.

Leaf curl of papaya

A disease similar to the leaf curl of cotton was observed on papaya (*Carica papaya*). It is characterized by the reduction of the size of leaves and petioles, curling upward of the leaves, and tapering of the upper portion of the stem. As shown in Figure 2, the leaves are markedly

Figure 2. A papaya plant infected with leaf curl, showing slender petioles and leaves curled upward. The plant was slightly stunted.

distorted. Although they retain the peltate shape, they become deeply lobed, with lobes pointing upward. Vein clearing and thickening are visible when the leaves are viewed through transmitted light. These symptoms are more easily detectable on the underside of the leaf.

This disease of papaya was first found in an orchard in Diliman, Rizal, in 1956. In most fields where it has been observed, a large number of trees were affected in varying degrees of severity. The best control measure appears to be the elimination of infected plants, all the underground parts of which should be removed and destroyed before replanting takes place.

Biological Control of St. Johns-wort in Chile

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As the demand for the expansion of grasslands in Chile has grown, much interest in weed control has been aroused, in order to improve the existing large pasture areas which have been invaded by unpalatable, or even toxic, weeds.

Grassland weeds are of great economic importance in Chile, as shown by the following outstanding examples: in the Lluta Valley, the northernmost valley of the country, salt grass, *Distichlis spicata* var. *thalassica*, is a noxious weed in alfalfa fields; south of this valley, in the Province of Coquimbo, *Astragalus* spp. invade natural pastures and are of great concern to cattlemen; in the central part of the country, from the Province of Santiago to Ñuble, *Galega officinalis* causes considerable losses, while bramble, *Rubus ulmifolius*, is invading grassland from Colchagua to Llanquihue; and blue weed *Echium vulgare* is often a severe problem for farmers in the south-central and southern part of the country.

St. Johns-wort has become a great nuisance on cattle ranches of the South during the last 15 years, invading mainly the precordilleran part of the Provinces of Ñuble, Bio-Bio, Malleco and Cautín, and now covering a belt 700 kilometers long. It was introduced from Argentina and has obviously found in Chile such favorable conditions for its establishment, that it had displaced valuable forage plants.

Biological control of weeds has been successful only in a limited number of cases but in these the results obtained have been outstanding. Among them, the control of St. Johns-wort with *Chrysolina hyperici* (Forst.) and *Chrysolina quadrigemina* (Suffrain) represents probably one of the major efforts made to control a weed by biological agents.

In 1948 the senior author had an opportunity to see the work carried out in biological control of St. Johns-wort in California and to report his observations to the Ministry of Agriculture in Chile. It was quickly realized that the introduction of these chrysomelid beetles might be of great benefit to the country.

In 1952 Dr. Raul Cortés R., of the Department of Agriculture, received from California 27,300 specimens of *C. hyperici* and *C. quadrigemina* and worked out a program for the release and establishment of these insects, which is still in operation. The introduction involved practically no risks, according to investigations carried out previously in California, since there was no doubt about the specificity of the host plants of these insects. The introduction was made through the National Entomological Station in La Cruz. Liberation of the beetles presented no problem, except that they arrived in Chile at a season opposed to that of their California origin and therefore had to be reared on St. Johns-wort grown in greenhouses.

Characteristics of St. Johns-wort

Europe and North Africa are the places of origin of St. Johns-wort but now it is established also in Australia, New Zealand, Canada, the United States and Argentina. In Chile it was first reported at the end of the last century. Here it actually covers a very well-defined area situated between the 35° and 41° parallels of southern latitude. Damage caused by this weed is most apparent in the Province of Ñuble and Cautín.

St. Johns-wort, which belongs to the family Hypericaceae, has an erect multi-branched stem 30 to 60 centimeters high. The leaves are opposite, simple, 10 to 25 millimeters long and 5 millimeters wide. The flowers are yellow and the fruit is a three-angled dehiscent capsule containing a large number of seed. Each seed is dark in color, elliptical, and very small. St. Johns-wort reproduces by both seed and short runners. The large number of seed produced enables the plant to spread very rapidly.

In addition to displacing rage plants, and thus reducing the value of pasture, St. Johns-wort is also poisonous to cattle, sheep and horses, as it contains a photosensible toxic substance called hypericin. Symptoms produced in animals feeding on this weed are inappetence, tachycardia, accelerated rhythm of respiration, fever and even diarrhea. Milk production of cows is reduced and abortions are frequent. The animals develop mouth ulcerations which prevent them from feeding, and they lose weight. The light parts of the skin peel and the hair either falls off in large quantities or becomes bristly, causing severe itching. Animals which survive this stage, later develop second-degree burns. Statistical data on the losses of cattle caused by St. Johns-wort are not available, but veterinarians estimate that the number of cattle killed by this weed is high.

Life cycle of the beetles

Investigations carried out in Australia led to the selection of two chrysomelid beetles of the genus *Chrisolina* for biological control of St. Johns-wort, namely, *C. hyperici* and *C. quadrigemina*. These two beetles are very similar and therefore it is of interest to outline their main distinctive characters. *C. hyperici* is 6 millimeters long; the elytra are dotted, the dots being depressions 80 μ in diameter and decreasing slightly in size toward the margin; 11 to 16 such dots form a row. The aedeagus is strongly curved, spatulated, and measures 1.75 millimeters in length. Green or bronze-colored specimens are predominant. *C. quadrigemina* is 7 millimeters long; the dots on the elytra are 50 μ in diameter and somewhat smaller toward the margin; there are 14 to 23 such dots in a row. The aedeagus is 3.25 millimeters long and is not spatulated toward the apex. Blue and purple-colored beetles are most common in this species.

Eggs are oblongovate, of light orange color, and approximately 1 millimeter long. The incubation period is from 18 to 29 days, apparently depending on the ambient temperature. The larval stage is composed of four instars, the third and fourth being most important for weed control, as at this stage of growth the larvae destroy the basal parts of St. Johns-wort. Fully grown larvae are 4 millimeters long and of a pink-grayish color. The larval stage lasts 25 to 40 days, depending on temperature. The adults emerge after 39 to 55 days from the dark reddish pupae cases, which are 6 millimeters long.

According to observations made during five years in Chile, mainly in the Bio-Bio area, the adults emerge from underground at the end of October. They are active until December, and during this period they feed exclusively on leaves, shoots, floral buds and flowers of St. Johns-wort. At the end of this feeding period they hide under stones, soil blocks or in soil fissures for estivation. Meanwhile, the weed becomes more lignified, the leaves turn red and dry, and the seeds ripen. In autumn the plants start their creeping growth, characterized by the formation of numerous leaf rosettes. At that time the lethargic insects again become active, copulate, feed moderately on the leaves of St. Johns-wort, and oviposit on the basal leaves or in the soil. This second period of activity often lasts until the end of July. The larvae, especially in their third and fourth instars, defoliate the plants so severely that they usually die. The larvae pupate underground at a depth of 2 to 3 centimeters. Surviving plants emit floral shoots but often disappear later, especially if the attack of adults during the next spring is massive. In case of light spring attacks, the plants may live a few more years.

In the area under observation, *Chrisolina quadrigemina* as compared with *C. hyperici* has shown a surprising adaptability to changing ecological conditions, which results in high infestations of the host plants. Therefore, this beetle seems to be the more effective agent for control of St. Johns-wort in Chile.

Organization and results of biological control

Most of the beetles received from the University of California were released in 1953 in the weed-invaded areas of the Provinces of Malleco, Bio-Bio and Ñuble. No further imports were necessary, as the foundation colonies gave rise to effective populations. In certain areas, as for instance at the San Elías (Victoria) Experi-

ment Station, eradication of St. Johns-wort has been accomplished. From these places the insects have spread and founded new colonies, in one case 45 kilometers distant from the initial point of release. In Mulchén, a ranch with a weed-infested area estimated at 1,700 hectares, the beetles have, within less than four years, practically eradicated St. Johns-wort. At this place the beetles have shown a surprising ability to spread to other infested areas, and in their southward spread they have even crossed the Renaico river. Many more examples might be cited to show the ability of the beetle to become established in Chile and to spread to new areas, although these areas are not uniformly covered with St. Johns-wort. There are, however, places in which the established colonies have not prospered as, for instance, in the Province of Cautín. Factors which disturb or limit the propagation of the beetles are under investigation and, although these studies have not yet been carried very far, observations seem to indicate that a moderate moisture content of the soil is favorable to emergence of the beetles. The effect of certain birds on the beetle population is also being investigated.

During the spring of 1958, 103,000 beetles were distributed in lots ranging from 5,000 to 40,000, for the establishment of new colonies. Each colony was located to afford a radius of action of approximately 10 kilometers. It is expected that the beetles will spread throughout this area within three or four years.

An estimated 7,000 hectares have been cleared of St. Johns-wort by biological means since the introduction of the beetles. In the South, farmers who are eager to improve their pastures are very favorably impressed by this new control method. Unfortunately, in many cases improvement of glassland has not kept pace with the destruction of St. Johns-wort and has not prevented invasion by gramineous weeds of the genera *Bromus*, *Cynosurus* and *Agrostis*. These weeds present additional problems in connection with biological control which should be investigated in the future.

Diseases of St. Johns-wort

In December 1957 a severe outbreak on St. Johns-wort was observed by the senior author. The most important causal agent was probably a fungus of the order Sphaeropsidales which, between 1957 and 1959, reduced the number of St. Johns-wort plants in some localities, as for instance in Perquenco (Cautín), by more than 50 percent. *Diploceras hypericinum* has also been found in association with the disease but is considered less virulent than the above-mentioned fungus. Infected plants turn reddish without losing their leaves, and at the end of spring or beginning of summer they become completely dry. The disease is being investigated, but it is premature to say whether it is of practical interest in biological control of St. Johns-wort.

Outbreaks and New Records

ITALY

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Occurrence of angular leaf spot of cotton

Angular leaf spot of cotton caused by *Xanthomonas malvacearum* (E. F. Smith) Dows. has hitherto not been reported from Italy. L. Petri,[1] in one of his last phytopathological reviews, called particular attention to the absence of this bacterial disease in Italy, and G. Goidanich,[2] in his description of this disease, also implied that it did not exist in the country. Consequently, in the Distribution Map of Plant Diseases No. 57 (2nd edition) issued by the Commonwealth Mycological Institute in 1952, Italy was not indicated as a country infested by *X. malvacearum*, but the disease was recorded in Greece[3] and Yugoslavia.[4] Considering the environmental conditions in the cotton-growing areas of these three closely situated countries, the writer was not convinced that the distribution of the disease should be confined to only two of these countries.

During five years spent in eastern Sicily, where cotton is grown on a fairly large scale on the plains of Gela and Catania, the writer made repeated efforts to find the angular leaf spot, without success. However, this bacterial disease was found by the writer to be widespread on the Adriatic Coast, in Apulia, where cotton is grown from Foggia to the Gargano mountains, causing damage especially to young plants.

This finding indicates that *Xanthomonas malvacearum* occurs in Italy approximately at the northern limit of cotton culture. In Sicily the disease is possibly checked by the high temperature and low air humidity during the summer, the two climatic factors which are less pronounced in Apulia.

[1] Petri, L. 1939. Rassegna dei casi fitopatologici osservati nel 1938. *Boll. Staz. Pat. Veg.* Roma, n.s. 19: 115-188.

[2] Goidanich, G. 1941. Le malattie del cotone. *Anonima Arti Grafiche S. A.* Bologna (p. 73).

[3] Maire, R. and J. Politis. 1940. Fungi hellenici, catalogue raisonné des champignons connus jusqu'ici en Grèce. *Act. Inst. Bot. Univ.* Athènes, 1: 27-179.

[4] Kišpatić, J. Vera Lušin and O. Klindić. 1952. Tretiranje sjemena pamuka formalinom i sumpornom kiselinom. *Zašt. Bilja* 10: 3-8.

SOUTHEAST ASIA AND PACIFIC REGION

Anthony Johnston, FAO Regional Office for Asia and the Far East, Bangkok

Spread of Puccinia polysora

During a plant disease survey carried out by the writer in May and June 1959 in the British Solomon Islands Protectorate, maize rust (*Puccinia polysora* Underw.) was discovered in several localities. This was the first time that the rust was reported from this territory. It was found on the islands of New Georgia, Gizo, Santa Ysabel and Guadalcanal, and is thus known to be widespread in this island group. Considering its wide distribution, and in view of the fact that some of the specimens were collected in small, isolated patches of cultivation surrounded by forests and far from other plantings of maize, it appears likely that the fungus has been in the Solomons for some time. Maize is a minor crop in the islands, usually scattered in mixed plantings of sweet potato, cassava and other crops, and the rust is causing neither serious damage nor losses of economic importance.

A visit was also made in May 1959 to Netherlands New Guinea, where *Puccinia polysora* was found attacking maize at Kota Nica Agricultural Experiment Station, near Hollandia. This constitutes the first record of the rust from the territory. There was no opportunity to examine maize in other localities in Netherlands New Guinea, and the geographical distribution of the rust within the territory is therefore not known.

Puccinia polysora, during its early outbreaks in Southeast Asia and the Pacific region, was not recognized as such and was confused with *P. sorghi*, which was then well known in the area.

The first definite record of the rust was published by Reyes,[1] who reported that it occurred in 1948 in three islands in the Philippines. That it was already at that time present in three localities indicates that the rust had probably reached the Philippines some time previously. The next recorded occurrence was in December 1950, when it was found for the first time in the Federation of Malaya[2] (Herb. IMI. No. 62163a). It is unlikely that the fungus reached Malaya much before that date because, despite fairly intensive collecting of fungi during the previous years, no rust of maize (except one collection of *P. sorghi* from the highlands) had been seen. Thereafter it was found in North Borneo in 1952 (Herb. IMI. No. 62556) and in Papua-New Guinea[3] and Thailand[4] in 1955. In 1956 it was collected by T. E. Cobb on Christmas Island, Indian Ocean (Herb. IMI. No. 62093) and by the writer in Singapore (Herb. IMI. No. 62166), and in 1957 it appeared in New Caledonia.[5]

It had in the past been assumed that *Puccinia polysora* spread to Asia from Africa but it is now apparent that the fungus was spreading through the two regions simultaneously. It seems, indeed, that Asia was invaded before Africa, where the first record of the disease was made in 1949.[6] How and when the rust reached Southeast Asia and the Pacific region is not known but it is not unlikely that it may have gained entry during or just after the Second World War, when large amounts of materials were transported into the region and the normal plant quarantine safeguards were not in operation.

The writer wishes to thank the Director of the Commonwealth Mycological Institute, Kew, for the identification of specimens of *Puccinia polysora* and for supplying information concerning specimens in the Institute's herbarium.

[1] REYES, G.M. 1957. Recent outbreaks of maize rust in the Philippines. *FAO Plant Prot. Bull.* 6 : 39-40.

[2] WILTSHIRE, S. P. 1956. Plant diseases in British Colonial Dependencies: A half-yearly report. *FAO Plant Prot. Bull.* 5 : 6.

[3] SHAW, DOROTHY. 1958. Notes from Papua and New Guinea. *Commonw. Phytopath. News* 4 : 61.

[4] WOOD, J. I. and B. R. LIFSCOMB. 1956. Spread of *Puccinia polysora* with a bibliography on the three rusts of *Zea mays*. Plant Disease Epidemics and Identification Section, Agr. Res. Service, *U. S. Dept. Agr. Special Publ.* 9.

[5] BUGNICOURT, F. 1958 (?). Institut français d'Océanie. *Rapport annuel* 1957.

[6] RHIND, D. 1954. American maize rust in Africa. *World Crops* 6 : 97-98.

Plant Quarantine Announcements

NICARAGUA

Regulations concerning importation of fruit and vegetables of 10 April 1959 came into force on 9 May 1959, when they were published in *La Gaceta*, Vol. 63, No. 101.

Importation of fruits and vegetables, as well as plants, parts of plants and soil adhering to them or used as packing material, is prohibited, except those fruits and vegetables whose importation is specifically permitted. In this connection the plant quarantine department will issue a list of fruits and vegetables which may be imported from certain countries, such list being revised whenever necessary.

For importations of fruits and vegetables a permit must be obtained in advance and the consignments must be accompanied by an official certificate of the country of origin in the form annexed to the International Plant Protection Convention of 1951. They are subject to inspection at both the point of entry and the place of destination and, if necessary, to disinfection. Fruits must be free from stems, leaves, stalks and other parts of plants.

For dried, cured, processed or frozen fruits and vegetables no import permit is required. If they are found infested or infected with pests or diseases, which are not known to occur or are not widespread in the country, they will be treated in a manner prescribed by the plant quarantine department. In the case of frozen fruits and vegetables, they must have been processed by quick freezing and are subject to inspection. If they are found to involve the risk of introducing plant pests or diseases they will be treated in a prescribed manner.

Fruits and vegetables, the importation of which is prohibited, will not be accepted for transit, even in the living quarters of the crew or any other place of a boat, ship, aircraft, etc. While ships stay in a harbor or in territorial waters, refuse of fruits and vegetables must be kept on board or disposed of under the supervision of the plant quarantine inspector.

UNITED STATES

A Foreign Quarantine Notice of 14 May 1959, published in the *Federal Register*, Vol. 24, No. 4023 of 19 May 1959, amends the Nursery Stock, Plants and Seeds Quarantine (Quarantine 37) Act. By this new amendment, the importation of seeds of *Lens* spp. from all South American countries is prohibited, on account of a rust fungus (a form of *Uromyces fabae*).

Seeds of *Lens* spp. from countries other than South America, which are free from pulp of a character that will support living larvae of fruit flies or other injurious insects other than stored product insects of general distribution, may be imported with a permit.

UNITED STATES TRUST TERRITORY OF THE PACIFIC ISLANDS

The Plant and Animal Quarantine Laws issued on 17 June 1959 supersede all previously issued legislation relating to plant and animal quarantine. The Plant and Animal Quarantine Control, which is the basic legislation contained in the Code of the Trust Territory Sections 730-739, remains unchanged but the Plant and Animal Quarantines and the Plant and Animal Quarantine Regulations have been amended. The following provisions govern the importation of plants insects and lower animals from areas outside the Trust Territory.

1. Living insects, snails, and other lower forms of animal life are prohibited to be imported into the Territory, except those authorized by the staff entomologist for experiments or biological control, and except domesticated bees, which are enterable under permit (Quarantine No. 1).
2. Fruits and vegetables which have not been canned, frozen, preserved or otherwise processed, may be imported only from the continental United States, except the following items, which may be imported from specified places (Quarantine No. 4):

Japan, *Okinawa*, and *Taiwan*. Celery, chives, garlic, leek, onions, arrowroot, asparagus, burdock, taro, ginger root, horseradish, lettuce, potatoes, radish, cabbage, Chinese cabbage, apples, pears, turnip, Irish potatoes.

Philippines. Celery, chives, garlic, leek, onions, Irish potatoes, ginger root, cabbage.

Hawaiian Islands. All fruits and vegetables, if treated in the same manner required for entry into the continental United States and accompanied by certificate. If not treated as required, Hawaiian-grown fruits and vegetables may be imported into Eniwetok Atoll, Marshall Islands, for use on Eniwetok and Bikini Atolls only.

Fruits and vegetables from other parts of the world and additional fruits and vegetables from the countries listed above are permitted to enter only under written permission of the staff entomologist.

3. Living plants and parts thereof intended for propagation may be imported under permit, except the following, the importation of which is prohibited:

(*a*) lantana (*Lantana camara*) plants and parts of plants;

(*b*) citrus plants (any member of the subfamily Rutelinae) or parts thereof capable of propagation (excluding seeds), except under special conditions set forth by the staff entomologist;

(*c*) cacao (*Theobroma cacao*) plants and parts thereof capable of reproduction, except under special conditions;

(*d*) coconut plants and coconuts, excluding husked coconuts and methyl bromide fumigated unhusked coconuts (Quarantine No. 5).

5. Soils, including compost and soil around the roots of plants, are prohibited entry. Clean ocean or quarry sand and certified sterilized soil are exempt from this prohibition (Quarantine No. 6).

6. Forest litter, sugar cane stalks, coconut fronds, grasses or any other unprocessed plants or parts thereof used as packing material are prohibited entry. The use of mature rice straw for packing is permitted (Quarantine No. 7).

In addition to the above, Quarantine Regulation No. 1 provides for the appointment and location of agricultural quarantine inspectors. Regulation No. 2 deals with the issuance of and application for plant and animal quarantine permits. Quarantine No. 9 and Regulation No. 3 provide for the predeparture inspection of any air or surface vessel moving within the Territory for the purpose of preventing the spread of the Giant African Snail (*Achatina fulica*) and the rhinoceros beetle (*Oryctes rhinoceros*).

News and Notes

DESERT LOCUST CONTROL

FAO panel of experts on the use of aircraft for desert locust control

Following the recommendations of the Eighth Session of the FAO Technical Advisory Committee on Desert Locust Control, the Director-General of FAO convened a panel of experts in Rome during April 1959 to consider the present status of aircraft methods of desert locust control and reconnaissance and to indicate lines along which further developments appeared particularly promising.

A review of the current situation showed that during the last five years at least 23 countries and territories have used a considerable variety of aircraft for various aspects of desert locust control, and that most national antilocust services had some experience in aircraft operations against the desert locust.

The insecticides most widely applied from aircraft were BHC, aldrin, dieldrin and DNC but promising results were reported with several others, notably diazinon and malathion. Spraying was virtually the only method now used for applying insecticides against the desert locust, dusting and baiting having been almost entirely abandoned. Best results were obtained when insecticides were applied in oil solutions and, for economic reasons, high concentrations were required. Insecticides were applied against egg-

fields, hopper bands and settled and flying swarms. Experience showed that highly concentrated insecticides did not present any undue hazards to operators. No authentic case of serious injury to man or domestic animals resulting from deposits of insecticides on vegetation was known and phytotoxic effects could be avoided by applying fine droplets.

The panel emphasized the value of aircraft for locust swarm reconnaissance. Swarms had been regularly sighted at distances up to 100 kilometers, and effective rates of search of 9,000 square kilometers per hour had been obtained repeatedly.

Experience in a number of areas has demonstrated that both for control and reconnaissance, aircraft have achieved results unobtainable by other methods, and that the cost of aircraft operations compare favorably, in terms of results achieved, with those of other control practices. Nevertheless, practically nowhere was full use being made of the potentialities of aircraft methods although it was evident that the present scale of over-all control operations fell far short of that demanded by the magnitude of the locust problem. It was further recognized that aircraft alone promise to provide the necessary increase control potential, that they offer the best opportunities for interterritorial co-operation, and that they could be the most effective form of regional strategic reserve.

In considering the further development of the use of aircraft in desert locust control, the panel emphasized the need for interterritorial co-operation and it recommended that governments, in building up their national aircraft units, should plan not only on a national but on an interterritorial basis, so that maximum control effort could be concentrated where most required. The panel studied the need and practicability of establishing an international antilocust aircraft unit, which it believed would constitute a most useful mobile strategic reserve in the control of the desert locust.

In the past, aircraft spraying had been used mainly as a last line of defense. It was now appreciated that swarms of the desert locust appear always to be present somewhere, and that the species was thus not intermittently but continuously vulnerable to attack by just that method of control which alone could match the locust's mobility.

However, the panel recognized that, particularly as regards strategy, the use of aircraft against the desert locust differs greatly from their use against other locusts or grasshoppers and from crop spraying practice. Successful operations for control reconnaissance requires sound organization and skilled personnel with appropriate experience.

FAO panel of experts on the strategy of desert locust plague control

In accordance with the views expressed by the Twenty-ninth Session of the FAO Council, the Director-General of FAO convened a panel of experts in Rome from 27 April to 1 May 1959, to advise on the most appropriate and effective manner in which FAO might apply its resources for desert locust plague control.

The 1956 FAO Panel of Experts on Long-Term Policy of Desert Locust Control (Ref. *FAO Plant Prot. Bull.* 4 : 145-147. 1956) reviewed the general and seasonal distribution of desert locust swarm breeding areas and the major swarm movements connecting them. On the basis of data made available by the Anti-Locust Research Centre, London, the recent panel brought this review of plague dynamics up to date.

Although the desert locust invades some 30 million square kilometers of Africa and southwestern Asia, the area in which it breeds covers only some 13 million square kilometers. Furthermore, breeding is more frequent in some parts of that area than in others, so that high-frequency breeding areas occupy a still smaller portion of the total invasion region.

The panel stressed the importance of these high-frequency breeding areas, the causes of which remain undetermined, though they are being studied by the FAO/UNESCO Desert Locust Ecological Survey and others.

Two great zones of seasonal breeding were recognized, one during the first half of the year, the other during the second, with the main

breeding occurring in different sections of the invasion region during alternate seasons.

In relation to control, it was noted that a large proportion of the 61 countries and territories subject to desert locust invasions would escape attack if control measures were effective in major swarm-producing areas in the more central part of the locusts' distribution region.

The analysis of the seasonal positions where swarm and hopper infestations were most frequent showed that during the July-September quarter, both swarm and hopper infestations become confined to a relatively restricted belt, even at the height of a plague. This season and belt might thus be expected to provide opportunities for concentrated control operations, which could have far-reaching effects on the course of the plague.

It was clear that fully effective desert locust control was not being achieved by present strategy, in which the major effort, on a national basis, was made when the plague was widest spread, while only limited local forces were available when the plague was concentrated in a confined region. The panel was convinced that, even with the present level of annual expenditure, control operations could be greatly improved, provided that correct methods and rational strategy were universally adopted. This necessitated treating the total invasion region as a whole and changing the over-all policy from defense to offense, concentrating control where and when it could achieve the greatest impact on the over-all situation during plague activity and during recession periods.

The panel proceeded to indicate how best the principles it had enumerated could be adopted to develop a more rational strategy through international, regional and national action.

Among other points, the panel emphasized that the success of the proposed strategy depended on reliable and up-to-date information on the current locust situation throughout the invasion region, requiring a general strengthening of information, reporting and forecasting services, and that there was a universal shortage of properly trained and experienced personnel in all aspects and levels of desert locust control, resulting in inefficiency and waste.

Finally, the panel stressed its view that though the proposed new strategic approach to desert locust control offered definite hope of subduing the current plague, it alone was not expected to prevent the recurrence of future plagues. This strategic approach would, however, contribute to achieving such prevention along the lines stated by the 1956 Expert Panel on the Long-Term Policy of Desert Locust Control, which has emphasized that further progress toward prevention of future desert locust plagues required intensified research and investigation. This view was strongly endorsed by the recent panel.

ROMA, 1959 — Tipografia del Senato del Dott. G. Bardi.

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